An Update On NCHRP 3-78A: Treatments for Channelized Turn Lanes, Single and Multi-Lane Roundabouts

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NCHRP

National Cooperative Highway Research Program

Where states ‘pool’ resources to address mutually agreed upon high priority issues

‘Solutions’ Oriented

Focus of Project

- **Blind and Visually Impaired Pedestrians**
- **Roundabouts and Channelized Turn Lanes**

Key Question

When is a facility
(in this case a CTL or a roundabout)
“accessible”
to a visually impaired pedestrian?

There is no argument about this

The performance problems of visually impaired pedestrians at these types of facilities are well documented . . . especially at roundabouts[1]

(1) National Institutes of Health (NIH) work on Performance Problems of the Visually Impaired at Complex Intersections - ongoing

Due in large part to

- Exclusive dependence on auditory cues
  - Absence of sounds associated with usual stop and go traffic
  - Masking of critical auditory cues by continuously moving traffic

And the anticipated problem in the future of:

Quiet Cars

Problems such as . . .

- **Difficulty in locating crosswalk**
- **Difficulty in reliably identifying crossable gaps**
- **Drivers who don’t yield to pedestrians**
- **Difficulty detecting vehicles that have yielded**

These problems result in:

- **Significantly increased pedestrian delay**
- **Acceptance of ‘risky’ gaps (a safety issue)**

Why is this important?

- The focus of potential Access Board rule making (at least for roundabouts)

- Would require some form of ‘signalization’ at multi-lane roundabouts
  - Would affect system cost
  - Could have a negative safety impact in the long term if willingness to construct new roundabouts is reduced (with loss of recognized safety benefits)

The Project Team

NC State University-ITRE
Western Michigan University
Accessible Design for the Blind (ADB)
Kittelson and Associates, Inc

Charlie Jones, Charlotte DOT, Traffic Safety Section
Dan Hartman and Vince Auriemma
Director and Deputy Director
Golden, CO Dept of Public Works

NCHRP 3-48A is charged with identifying and evaluating potential ‘solutions’

Solutions to be installed and evaluated represent the consensus of the research team and have the concurrence of the NCHRP Panel

3-78A Treatment Selection Process

- Nothing was initially off-limits
- Selected treatments are scalable and applicable to both CTL and RBT
- Focus is on what treatments could potentially impact what parameters of the general accessibility concept

General Accessibility Concept?

- Asserts that accessibility is a function of:
  - Availability of crossable gaps
  - One's ability to reliably detect and accept those gaps
  - The extent to which crossable gaps are created by drivers who yield to pedestrians
  - The extent to which gaps created by yielding motorists are accepted by the pedestrian

So, what is 3-78 trying to do?

- NCHRP 3-78 is attempting to measure the extent to which certain treatments can be demonstrated to have a reliable and measurable impact on the components of accessibility.

- It is not the intent of NCHRP 3-78 to define a ‘warrant’ for what is accessible

NCHRP 3-78A
Treatments to be Evaluated at <u>Three Sites</u>:

Single Lane Roundabout – Charlotte NC

Channelized Turn Lane – Charlotte, NC

Multi-Lane Roundabout – Golden, Colorado

Treatment Rationale:

Similar performance problems at roundabouts and CTLs

Similar treatment solutions?

PEDESTRIAN-ACTUATED FLASHER WITH AUDIBLE PEDESTRIAN SIGNAL (application to single lane RBT and CTL)

SOLAR POWERED

PEDESTRIAN-ACTUATED

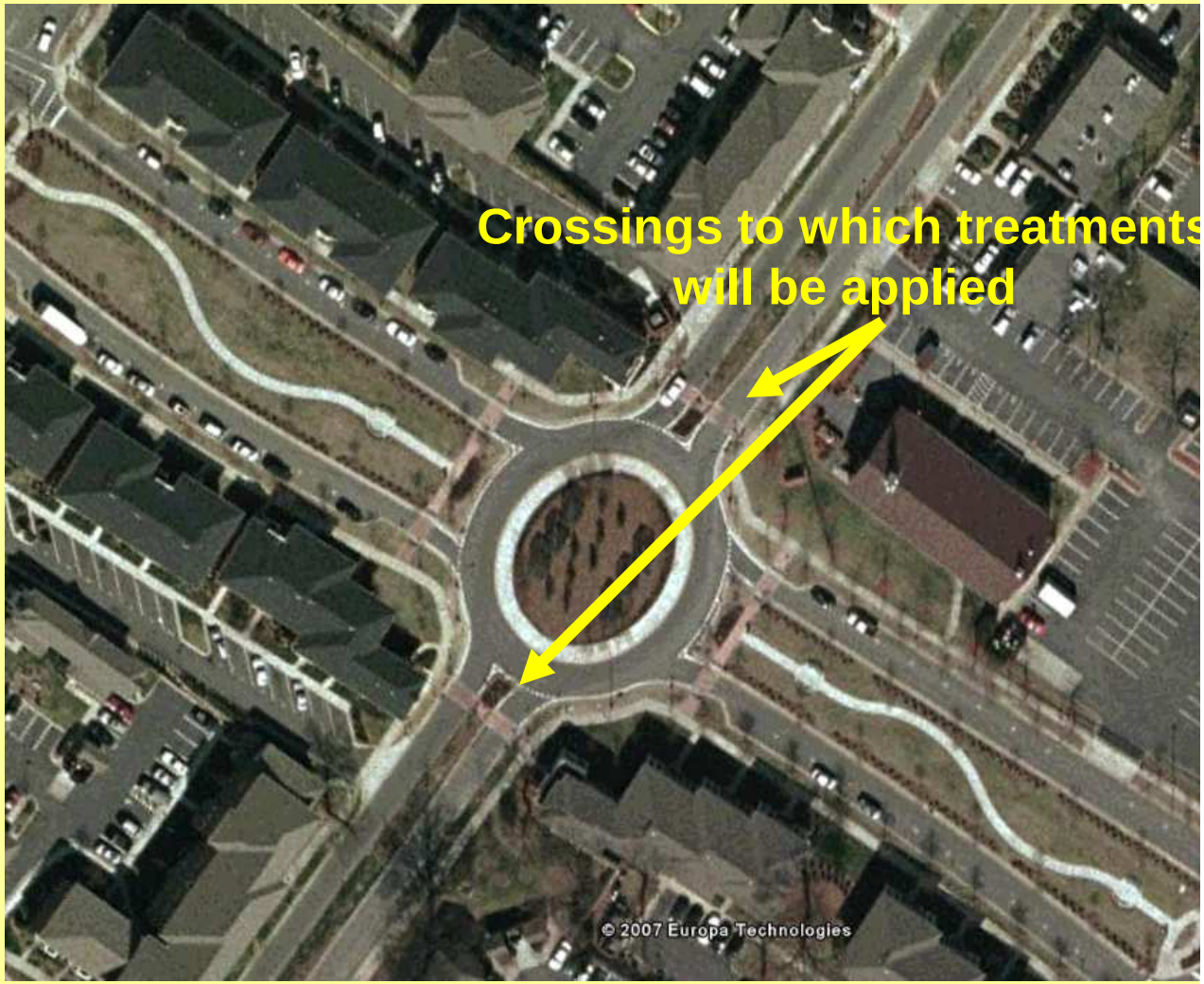
AUDIBLE PEDESTRIAN SIGNAL

Sound Strip Application in NCHRP3-78A (Single Lane RBT and CTL)

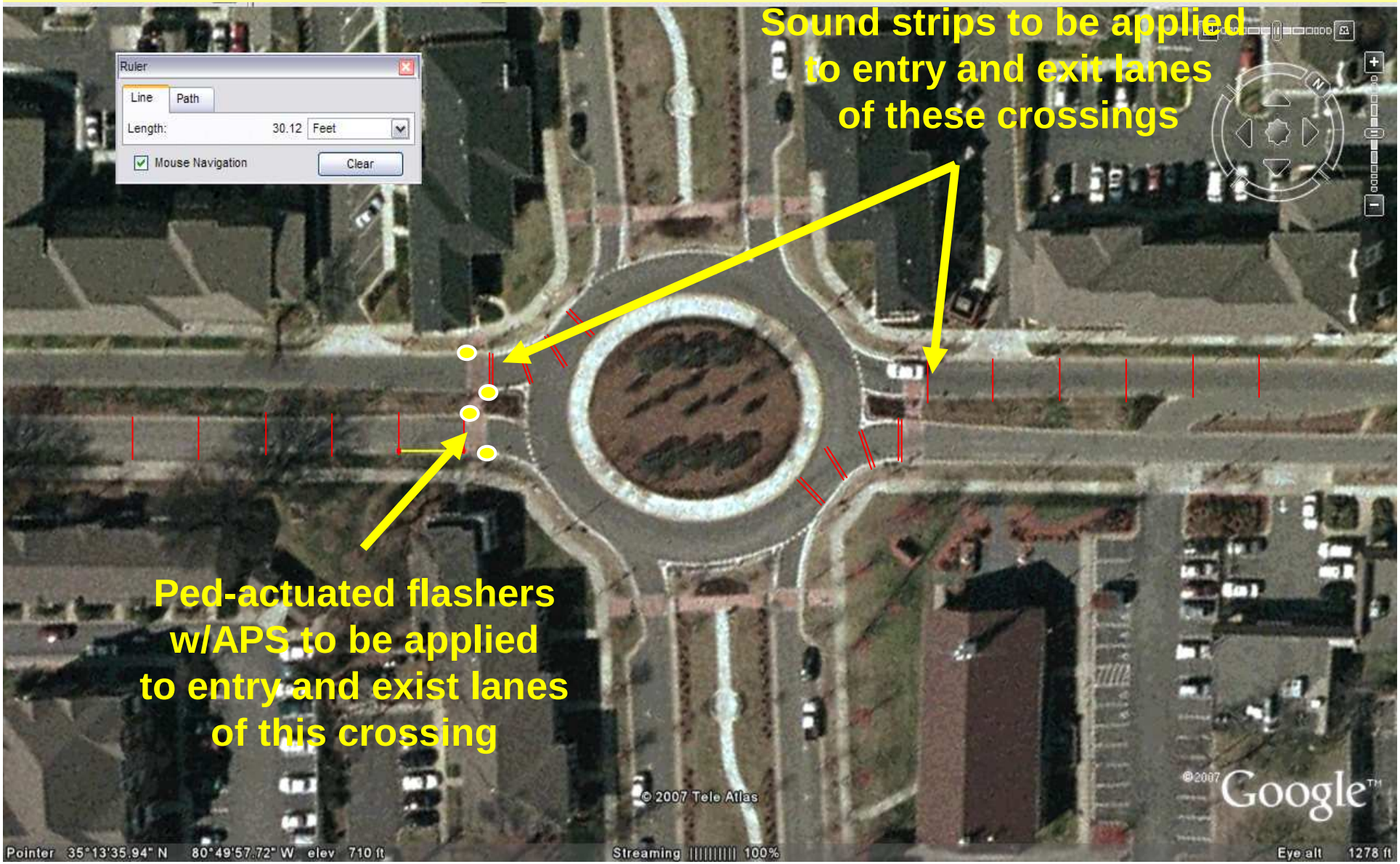
- Sound Strips at Single-Lane Roundabout and CTL only
- Strips spaces approximately 1 second apart (at 30ft/sec that is 30feet)
- Different Sound ‘Patterns’ used for Entry and Exit Leg
- More durable material made for roadway application (color to blend with roadway surface)

Single-Lane Roundabout

9th St. @ Davidson St., Charlotte, NC

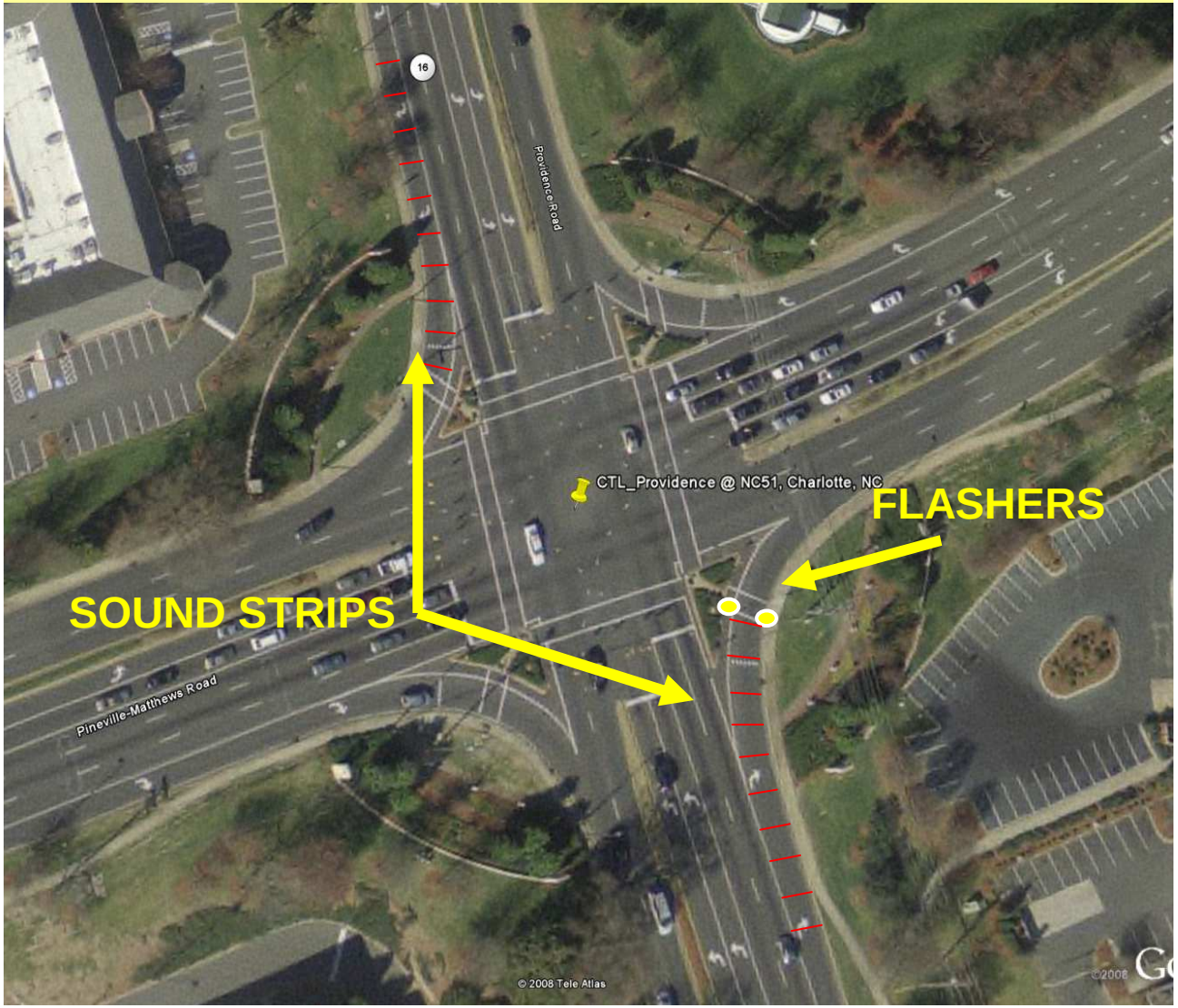


Sound-Strips and Flashers at Charlotte RBT



Channelized Turn Lane

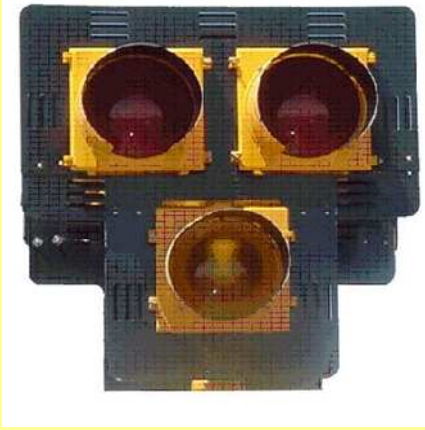
Providence Rd. @ NC51, Charlotte, NC



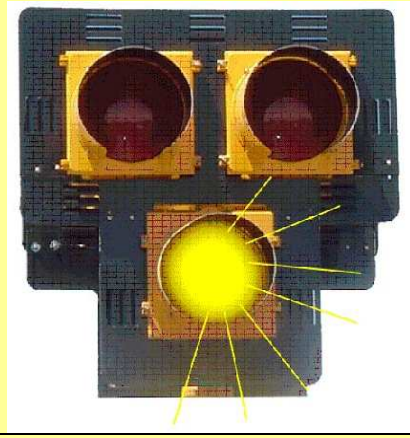
Multi-Lane Treatments

Ped-actuated ‘flashers’ with or without the addition of sound strips judged not to be sufficient at multi-lane roundabout

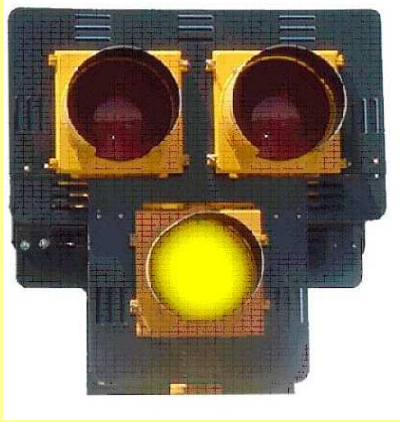
Pedestrian Beacon (HAWK) proposed as one multi-lane treatment



Dark Until Activated

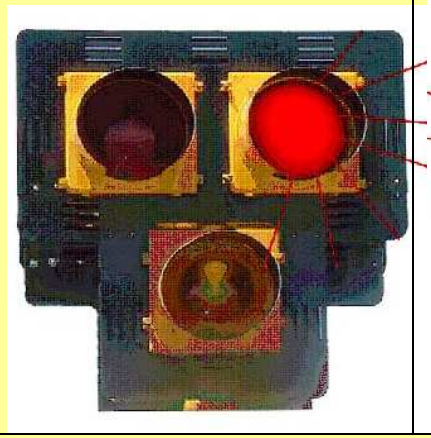


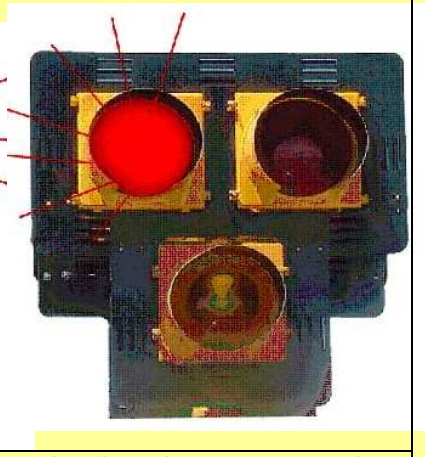
Flashing Yellow



Steady Yellow

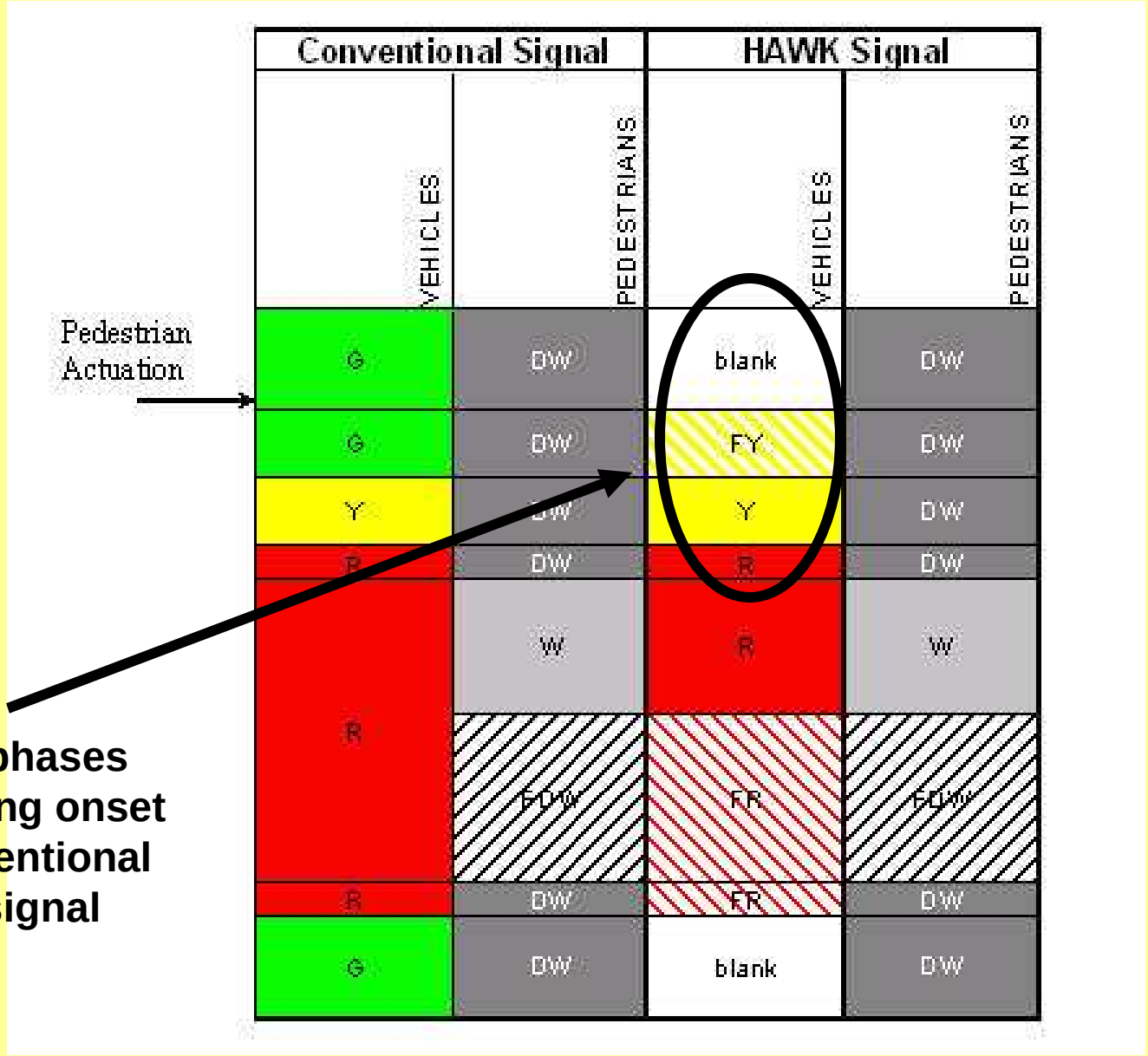
Steady Red during Pedestrian Walk Interval





Alternating Flashing Red During Pedestrian Clearance Interval

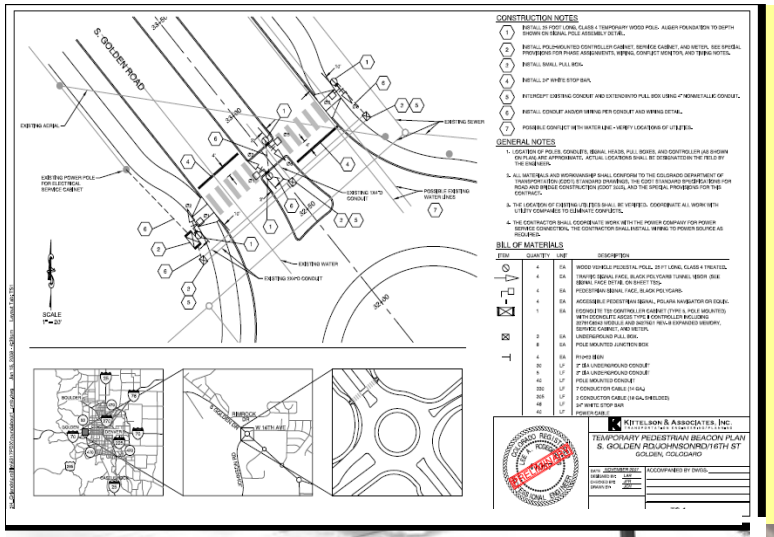
Correlation between HAWK and conventional WALK/DON'T WALK phases



HAWK to be installed in conjunction with:

- Audible Pedestrian Signals (APS), pedestrian locator tone, and conventional WALK/DON'T WALK ped heads
- Tactile warning surfaces
- Pedestrian island/median
- Conventional crosswalk striping

Multi-Lane Roundabout
at
South Golden Rd and Johnson Rd
Golden, Colorado



Current Status

- Pre-treatment ('before') data collection completed at each of the three sites
- CTL treatment installation (flashers and sound strips) summer 2008; evaluation early fall 2008
- Multi-lane RAB treatments (HAWK and raised crosswalk) being installed now with evaluation, fall 2008 – Golden, Colorado.

(1) HAWK installation partially funded by US Access Board

What is status of treatment installation and evaluation at single lane RAB in Charlotte?

- NCHRP Panel directed on 5/15/08 that treatment installation and evaluation at the single lane RBT site in Charlotte be cancelled.

- Questioned whether anything of value would be gained from a demonstration of improved yielding if site was already determined to be ‘accessible’ (i.e., not excessive delay or risk – although very low yielding rate) despite team recommendation to proceed and 4:3 panel vote to proceed.

- Project team was asked for estimate of cost to identify a more desirable site. No funding was identified. No plans at the moment to evaluate a single lane RBT treatment.

- To the extent that crossing problems are functionally similar at CTLs and single lane RABs, there will still be effectiveness data on the flashers and sound strips from the Charlotte CTL site

- CTL treatment results would have to be ‘generalized’ (an ‘inductive leap’ if you will) to single lane RABs

- Data are still needed for higher volume single lane RABs (high ped delay, high risk, low yielding by drivers)

Potential Multi-Lane Evaluation
(Independent of NCHRP funding)

- Multi-lane facility in Michigan (focus of court-directed evaluation of signals)
- Negotiations with locals on cost sharing of a HAWK installation and evaluation on 3-leg approach
- Would be conducted by members of NIH and NCHRP research team members

Difficult Questions

- At what point does pedestrian delay make a site ‘inaccessible’?
- When does ‘risk’ (interventions, pull backs, acceptance of ‘risky gaps’) make a facility inaccessible, or does it?
- When does ‘risk’ become unacceptable from a safety standpoint? Can you have accessibility and some level of risk? How much?

Difficult Questions, Con't

- Is there a level of drivers' failing to yield to pedestrians that constitutes inaccessible? While treatments that can increase driver yielding are not the 'ideal' solution, they can be a 'feasible' approach to improved accessibility.

- Yield detection is a critical performance component that affects accessibility – is there a current engineering solution that is less cost prohibitive than signals – to get the same effect? Where should implementation priorities be?

Are we closer to a solution?

- The project team response: a '*qualified Yes*.'
- The NCHRP panel seems, perhaps, less confident.
- The 'tone' of posts to the Roundabout List Serve prior to this year's National Roundabout Symposium suggests some are losing their commitment to doing anything for those with special needs.
- On the other hand, there is evidence 'in the field' that alternatives discussed by 3-78 are being implemented at least on an experimental basis

Ped-actuated flashers at (somewhat) 'distal' Crosswalk location on LaJolla Blvd, Bird Rock Project outside San Diego, CA

Signalized 'distal' crosswalk 8-10 car lengths Downstream of single lane RAB, Ireland

Use of rectangular-shared LED rapid-flash

“Consensus” on difficult issues (like, what is ‘accessible’) is never easy to achieve

We can’t develop a ‘warrant’
until we understand the factors that have a measurable effect
on the various performance conditions
upon which the concept is based

More information online at ITRE website at:
http://www.itre.ncsu.edu/VAMS/VISUAL/index.html

ITRE's Role in NCHRP Project 3-78

3D Visualizations of Alternative Crossing Solutions for Visually Impaired Pedestrians at Roundabouts and Channelized Turn Lanes

As part of NCHRP Project 3-78, "Crossing Solutions for Visually Impaired Pedestrians at Roundabouts and Channelized Turn Lanes," ITRE partnered with the Visualization Section of the NY State DOT to create high resolution 3D visualizations of alternative pedestrian crossing solutions. The visualizations were intended to support the interaction between the project team and the NCHRP 'panel' as well as the interaction between the project team and local jurisdictions interested in participating in the installation and evaluation of proposed treatment alternatives. Alternative treatment solutions have been presented in a 'matrix' that allows the user to view combinations of 'proximal' or 'distal' crosswalk placement in conjunction with the use of raised crosswalks, sound-generating strips intended to provide blind pedestrians with enhanced auditory cues associated with vehicles that yield, as well as alternative 'signal' applications. Signal applications range from the recommended use of pedestrian-actuated 'flashers' to the use of HAWK pedestrian beacons at multi-lane facilities. Images in the matrix allow the user to see views from the pedestrian as well as driver viewpoints. Driver viewpoints show both exit and entry lane views. The visualizations also provide images of a zig-zag, or offset, crosswalk option.

www.itre.ncsu.edu/NCHRP378/

The visualizations portray solutions as they might be applied to a single lane roundabout. The functional nature of the solutions, we believe, makes them applicable also to multi-lane facilities although visualizations of multi-lane applications are not provided as part of the treatment matrix.

Treatment alternatives were selected by the project team based upon their ability, at least in principle, to satisfy the functional crossing needs of visually impaired pedestrians; specifically, the ability to increase crossable gaps, an improvement in the ability of the visually impaired pedestrian to reliably detect crossable gaps when they occur (such as those produced by voluntary driver yielding), the ability to reduce both pedestrian and pedestrian-induced vehicle delay, and/or the ability to reduce the tendency for visually impaired pedestrians to take "risky" gaps.

continued

A virtual, interactive 'matrix' of possible treatment solutions

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